Solid State Phenomena, 2018, vol.284 SSP, pages 1114-1118

Development of sulfur and silicon dioxide activation method in the sulfur concrete technology

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Abstract

© 2018 Trans Tech Publications, Switzerland. The paper investigates the recovery problem of waste sulfur from metallurgical, oil and gas plants. The method was developed to synthesize inorganic sulfides and sulfur concretes from them using the activating agent – titanium chloride and different silica-containing raw materials. The chemical interaction between sulfur, titanium tetrachloride and silicon dioxide encourages the formation of a strong and compact structure in the material. The physical chemical and quantum chemical calculations confirmed the formation of titanium silicate sulfide and made it possible to suggest the concept of sulfur concrete synthesis. It was found how the amorphous component in the filler influenced the properties of sulfur concrete. The physical mechanical tests were performed on the specimens of sulfur concrete, based on opal crystobalite rock from the different fields. The optimum sulfur concrete formulation was determined. The specimens with the optimum composition have high coefficient of resistance to HCl, H2SO4, CaCl2, NaCl, MgSO4 solutions, high impact resistance, freeze resistance and density to meet GOST concrete standard. The resulting materials can be used for production of some construction materials: paving slabs and blocks, road building materials.

http://dx.doi.org/10.4028/www.scientific.net/SSP.284.1114

Keywords

Opal-crystobalite rock, Silicon dioxide, Sulfides, Sulfur, Sulfur concrete, Titanium chloride, Titanium chloride silicate

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